



Research article

Latex and synthetic rubber glove usage in UK general dental practice: changing trends

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ABSTRACT

Objectives: To evaluate the current routine use of latex gloves and latex containing dental dam in UK general dental practice.

Methods: A questionnaire was disseminated to 89 general dental practitioners (GDPs) in June 2017. The survey concerned their current, routine use of latex gloves and latex-containing dental dam in general dental practice. In addition, monthly sales figures of gloves classified by material, were obtained from a UK dental supply company, for 2015–2017.

Results: The questionnaire response rate was 84 (94%), of whom 90% reported using non-latex (non-sterile examination) gloves for their routine dentistry. The majority were using nitrile gloves. All GDPs surveyed would use examination gloves for routine extractions, and 76% would use examination gloves for surgical extractions. The majority (75%) reported using non-latex dental dam. Sales of nitrile gloves were significantly higher than for latex gloves, with a continuing trend in the reduction in volume of sales of latex gloves.

Conclusion: The majority of GDPs now routinely use non-latex containing gloves and dental dam in their clinical dentistry. Nitrile gloves are predominantly used. Examination gloves are used for straightforward extractions, with many practitioners also using them for minor oral surgery. Sales of latex containing gloves are continuing to decrease.

Clinical significance: The routine use of latex-containing products in UK dental practice is low and likely to reduce further, with on-going benefit for the dental practitioner, latex allergic patients and prevalence of latex allergy in the general population.

1. Introduction

Natural rubber latex (NRL) originates from the tropical *Hevea brasiliensis* tree [1, 2]. During the manufacturing process the sap from the tree is processed along with approximately 200 different chemicals and additives [1, 3, 4], all of which determine the properties of the end-product [3]. Many items found within the dental clinic can contain NRL including, but not limited to; gloves, dental dam, local anaesthetic cartridges, adhesive tape, tourniquets, rubber bands and resuscitation equipment [2, 3].

A surge in the incidence of NRL allergy occurred in the late 1980s [5] and latex surfaced as a significant occupational health hazard [2]. Approximately 1% of the general population was reported as being affected by NRL allergy [5, 6] however in health care workers it was reported as high as 5–17% [5], with continuing exposure to NRL being the most important risk factor. In more recent years however the

occurrence of allergic reactions to latex has reduced, in part as a result of improved preventive measures [4]. These measures include the use of alternatives to latex containing materials in healthcare, including in the dental surgery, however, there is little data on how widespread the use of such materials have become, nor how well tolerated in dental practice these products are.

The aim of this study was to investigate the current frequency of use, and acceptability, of latex and non-latex containing dental gloves and dental dam in general dental practice in the UK by two different sources of data. General dental practitioners in the UK were invited to complete a questionnaire, which focused on the use of gloves and dental dam for their clinical work, while a well-known dental supplier was contacted with regards to their sales of different glove types. The purpose of which was to explore whether practitioners were making choices to avoid latex and therefore allergic reactions in the dental setting.

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2. Methods

The design of the study was a cross sectional survey with primarily quantitative data, but with a qualitative element. A self-completed, anonymous, questionnaire was developed. This questionnaire was then piloted amongst 10 general dental practitioners at a postgraduate meeting in Northern England. Following feedback, modification of the questionnaire was undertaken resulting in a final version (Appendix 1). This final version was disseminated to all general dental practitioners (GDPs) attending NHS-funded postgraduate 'Section 63' meetings in Aberystwyth, Wales and Manchester, England, in June 2017. Other than the above, there were no inclusion and exclusion criteria for the study. The survey concerned the current, routine use of gloves and dental dam in general dental practice and whether they contained latex or were made from other materials. The closed sections of the questionnaire asked questions on (i) the composition type of gloves worn for dental examinations, (ii) the composition of gloves worn for straightforward extraction of teeth, (iii) the composition of gloves worn for surgical extraction of teeth, (iv) if there were any specific tasks for which latex examination gloves were used, and (v) the composition of dental dam routinely used. The questionnaire also included one open question asking whether there were any specific tasks for which a latex examination glove would be preferred to be used over a non-latex containing glove for routine dentistry. GDP's were made aware of the questionnaire and its focus during the meeting. Voluntarily completed questionnaires were collected during the meetings and the results analysed anonymously. Summary statistics (for example percentage of responses) were calculated as appropriate for each question. As the aim of the paper was to summarise the practising arrangements of general dental practitioners with respect to glove and dental dam usage, there were no formal, pre-specified, hypotheses and thus the presented analyses are of a descriptive nature only.

In addition to the questionnaire, information on the quantity of latex and non-latex gloves sold between January 2015 and January 2017 by a UK dental materials supply company (The Dental Directory, Witham, Essex) was obtained following a direct enquiry to the company.

3. Results

3.1. Results from the questionnaire

The response rate was 94%, with 84 out of 89 GDPs surveyed returning the questionnaire.

- (i) Of these 84 practitioners that responded, 90% reported using non-latex gloves for their examination (non-sterile) routine dentistry

(Figure 1), with only 10% routinely using a latex containing product.

The 76 practitioners who routinely used non-latex gloves were asked what material these gloves were manufactured from (Figure 2.). Most practitioners, 84%, were using nitrile gloves, 3% reported using vinyl gloves and 13% did not know the material of their gloves.

- (ii) When asked regarding the type of glove routinely used for straightforward extractions, 100% of GDPs stated they would use examination gloves.
 (iii) For minor oral surgery procedures 11% would use sterile surgical gloves with 76% using examination gloves. 11% of practitioners said this question was not applicable to them and 2% did not answer (Figure 3).

Of the 9 practitioners who reported using sterile surgical gloves, 55% reported using nitrile sterile gloves and 45% were not sure of the material of the sterile glove they were using. No practitioner reported explicitly using latex sterile surgical gloves.

- (iv) Practitioners were then asked 'if you use non-latex examination gloves for routine dentistry are there any specific task for which you would change to a latex containing glove?' Of the 76 practitioners who use non-latex gloves routinely, 96% responded to this question. Of these 73 practitioners, 97% said no and 3% said yes (Figure 4). Practitioners who answered yes were asked for the reasons why they might change gloves. The two answers volunteered were as follows;

- 'Allergy to nitrite'
- 'If I can't get nitrite gloves back on mid-treatment'

- (v) Practitioners were finally asked what type of dental dam they used routinely. 95% of practitioners responded. Of the 80 respondents 75% reported using non-latex containing dam and 11% latex containing dam. 14% of practitioners did not know whether the dental dam they used routinely contained latex (Figure 5.).

3.2. Results from dental materials supply company sales enquiry

The volume of sales by unit quantity obtained from the dental materials supply company is displayed in Figure 6. This shows the sales of latex, nitrile, vinyl and synthetic gloves over a two year period. The graph clearly shows nitrile gloves have consistently outsold latex gloves throughout this period. Furthermore, the sales of nitrite gloves increased by 31% (48k-63k) from January 2015 to January 2017, whilst the sales of latex decreased by 48% (33k-17k) in the same time period, indicating

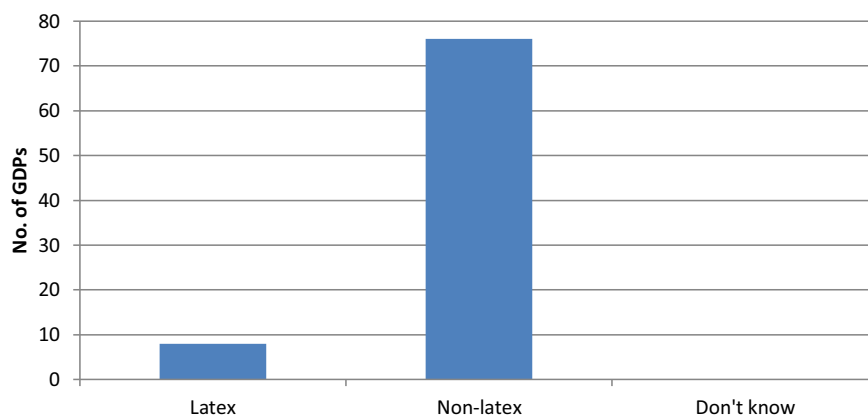


Figure 1. What type of examination (non-sterile) gloves do you routinely wear for dentistry?.

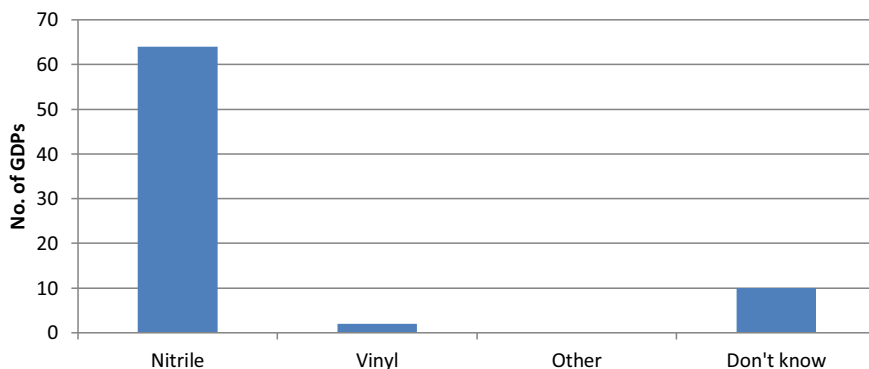


Figure 2. If non-latex gloves are used which material are they made from?.

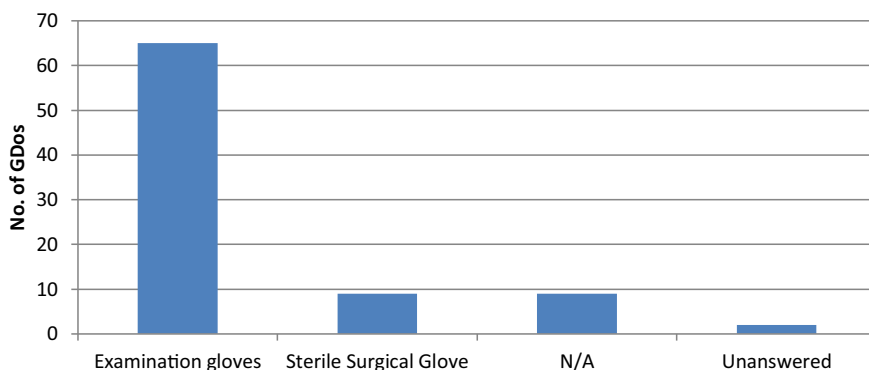


Figure 3. What type of gloves do you routinely wear to carry out minor oral surgery?.

a clear on-going trend towards nitrile glove usage at the expense of latex gloves. The sales of vinyl and synthetic gloves were minimal.

4. Discussion

The use of disposable natural rubber latex (NRL) gloves as an essential part of infection control in dentistry followed the discovery of HIV and AIDS in the 1980's and the introduction of universal cross-infection control measures [7]. Today the use of gloves in dental surgery is mandatory, with their ability to substantially decrease the amount of blood transferred by a needle stick injury [8], a key factor in this. In addition, gloves can be protective against chemicals and materials used in the treatment of patients from coming into direct contact with the skin.

The wearing of gloves can cause adverse reactions. The most frequent adverse reaction is a non-immunological reaction known as irritant contact dermatitis [3, 9], which can occur with all tight fitting gloves which occlude the skin. This presents as dryness or soreness and can be caused by multiple factors, including inadequate hand care when using gloves [3]. Predisposing factors include friction, perspiration, and

extreme humidity and temperature conditions. In addition specific reactions can occur to the specific glove material used, although these are less frequent than irritant contact dermatitis. The increased use of NRL in healthcare, including dentistry, in the 1980's and 1990's, did lead to adverse effects in some patients and healthcare workers. Two main types of adverse reactions to NRL can occur. The first is a Type IV, delayed hypersensitivity reaction, also known as allergic contact dermatitis, which occurs in reaction to the processing chemicals in latex [5, 9]. In dentistry this predominately affected dentists and dental care professionals, rather than patients. The second adverse reaction is a Type I hypersensitive reaction (allergy). Many proteins within latex have been identified as potential causes of allergy [2, 10]. The most serious reaction, IgE mediated immediate Type I reaction, is to one of these proteins [5, 9]. This can lead to a range of symptoms from a rash, itchy eyes and runny nose, to anaphylactic shock [2]. In addition, when powdered gloves were used in clinical settings, on removal of these gloves the proteins could become airborne causing respiratory complications [9]. Both healthcare workers and patients can be affected by Type I allergy to NRL.

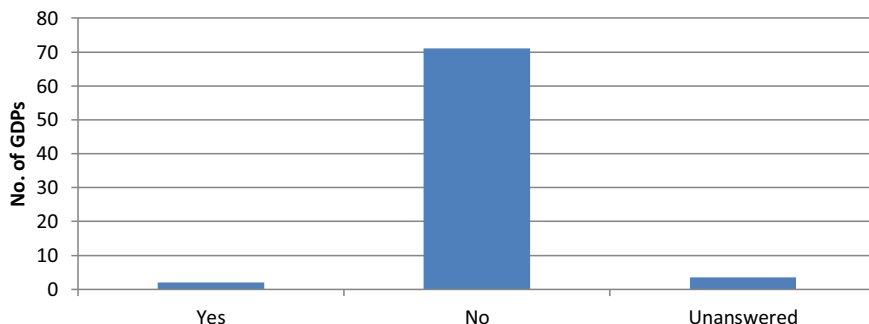


Figure 4. If you use non-latex examination gloves for routine dentistry are there any specific tasks for which you change to a latex containing glove?.

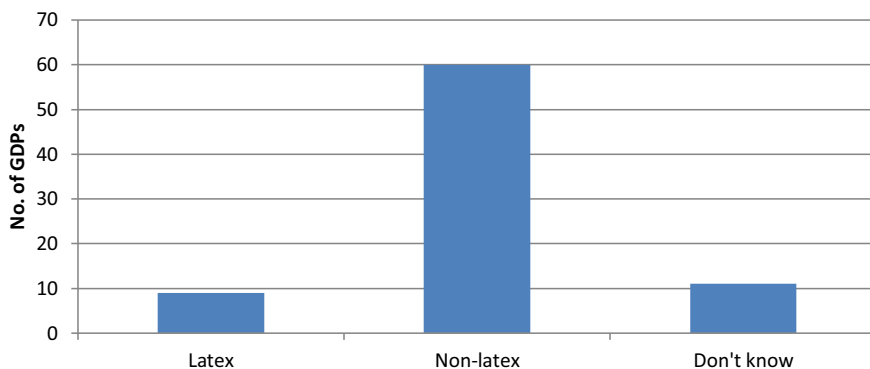


Figure 5. What type of dental dam do you routinely use when needed?.

Historically, NRL gloves have been said to be superior to other materials when it comes to manual dexterity [2], however the results from this questionnaire do not support this in the context of current routine dentistry, as there were no specific tasks identified by the GDP's that would require them to change from nitrile to NRL. This implies that there is no specific advantage in manual dexterity with latex gloves, compared to non-latex gloves for routine dentistry. Furthermore, nitrile gloves have been shown to be equally as resistant to puncture as NRL gloves [8, 11]. With this knowledge, and alongside the understanding that the best treatment for latex allergies is avoidance[4], the great majority of GDP's have now moved towards using latex free gloves. Additionally, more practitioners are also choosing to use latex free dental dam. However, some were unsure whether the dental dam they used contained latex or not. Not all dental dams are latex free and more awareness amongst dentists of this would be of benefit. (for example, 'Directa Dry Dam' is a latex containing product which loops around the patients ears) [12].

Nitrile gloves are the commonest used gloves in general practice, likely due to their superior properties compared to alternative, non-latex containing gloves. Nitrile gloves, however, can still cause problems [13]. These problems are predominately found in the healthcare workers who use the gloves, rather than the patients being treated. Allergic contact dermatitis may develop due to the chemicals involved in the production of nitrile gloves, including the lubricant cetylpyridinium chloride [14]. Allergic contact dermatitis to the blue pigment commonly used in nitrile gloves, has also been reported [15]. In general however, hypersensitivity

to nitrile gloves appears to be far less of a problem than with latex gloves, and severe IgE mediated allergy has not developed.

Interestingly, many practitioners are choosing to use examination gloves for both their straightforward extractions and surgical extractions. Whilst this may be less frequent in hospital practice, there is a lack of high-quality evidence surrounding the benefit of sterile gloves over non-sterile [16, 17]. A systematic meta-analysis of studies investigating post-operative surgical site infection following use of sterile versus non-sterile gloves in outpatient surgical procedures found no significant difference [13].

The results in this survey confirm the on-going and accelerating trend away from latex containing gloves in general dental practice, in the UK. One of the limitations of this study is that only two regions of the UK were involved, and it would have been interesting to see the changes in trends across different regions. However, a survey of primary care dental practitioners in 2000 found that 87% wore latex containing gloves, with 11% wearing latex-free gloves [18]. A repeat survey of primary care dental practitioners in 2008 found that 81% were wearing latex containing gloves, with 19% wearing latex-free gloves [19]. A similar survey in 2015 found a radical change in glove material being used, with the wearing of latex gloves having dropped to 25%, with 75% wearing latex-free gloves [20]. The results from a 2017 survey presented here help to confirm the on-going trend away from the use of latex gloves.

Following on from this survey it would be interesting to assess further changes in trends, in particular the use of sterile and non-sterile gloves.

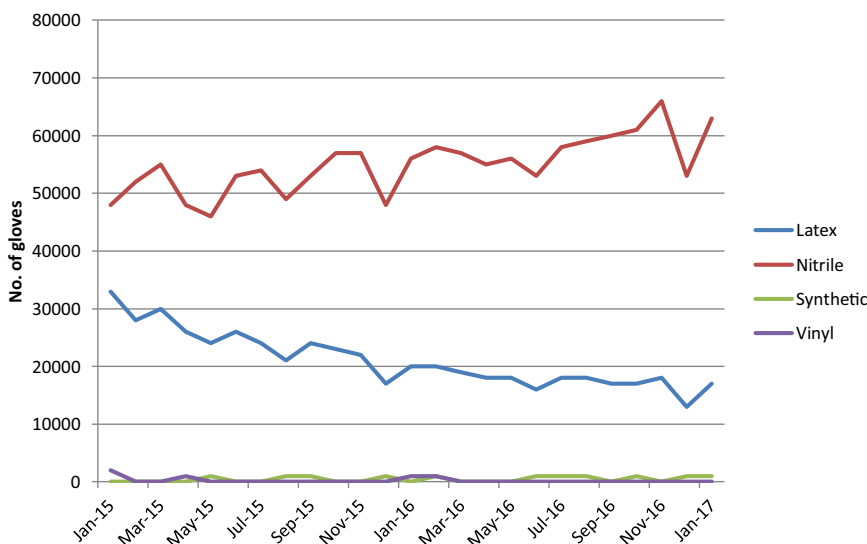


Figure 6. Glove type quantity of sales by month and year. Information obtained from The Dental Directory.

5. Conclusion

Nitrile examination gloves are replacing NRL gloves in general dental practice. Non-latex containing dental dam also appears to be replacing latex containing dental dam. These changes are in line with changes in other healthcare settings where latex free products are now being used. This reduction in latex use will help reduce the incidence of new cases of latex allergy and also reduce the risk of an allergic reaction to latex occurring in the dental setting. If current trends continue it is likely that NRL examination gloves will be completely replaced by nitrile gloves in general dental practice. This change is to be encouraged.

Declarations

Author contribution statement

E. Critchley: Analyzed and interpreted the data; Wrote the paper. **M. Pemberton:** Conceived and designed the experiments; Performed the experiments; Wrote the paper.

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Competing interest statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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Appendix 1

GDP LATEX USAGE SURVEY

This one-page survey concerns the current routine use of latex gloves and latex-containing products in **general dental practice**. The survey is anonymous. The results will be collated and may contribute to a publication. All data will be treated confidentially. When thinking of your main place of work in general dental practice, please circle the correct answer, or delete the incorrect answer, and give more details where asked.

If you are NOT a dentist in general dental practice, then please circle this line and return the form.

If you are a dentist in general dental practice then please continue and **circle your responses**.

GLOVES

A. What type of **examination** (non-sterile) gloves do you routinely wear for dentistry?

- i) Latex OR Non-latex OR Don't know (please circle)
- ii) If **Non-latex**, are these Nitrile

(Please circle) Nitrile.
Vinyl.
Other (please state type...)
Don't know.

(If don't know, what colour are the gloves...)

B. What type of gloves do you **routinely** wear to carry out **straightforward extractions**?

- i) Examination gloves OR Sterile Surgical gloves (please circle)
- ii) If **Sterile Surgical gloves**, are these Latex

(Please circle) Nitrile.
Vinyl.
Other (please state type...)
Don't know.

C. What type of gloves do you **routinely** wear to carry out **minor oral surgery**?

- i) Examination gloves OR Sterile Surgical gloves OR Not Applicable (do not carry out MOS) (please circle)
- ii) If **Sterile Surgical gloves**, are these Latex

(Please circle) Nitrile.
Vinyl.
Other (please state type...)
Don't know.

D. If you use Non-latex examination gloves for routine dentistry, are there any specific tasks for which you change to a latex containing examination glove? Yes/No.

If Yes, please give details and reason why ...
Dental Dam.

What type of dental dam do you **routinely** use when needed? (Please circle)

Latex containing OR Non-latex containing OR Don't know.

Thank you for completing the survey. Please return the form.

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